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Eczema and Beyond: The Growing Trend of Complementary and Alternative Medicine

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Abstract **Background:** Eczema, an inflammatory skin disorder, represents the most prevalent dermatological condition in Saudi Arabia. The use of Complementary and Alternative Medicine (CAM) is widespread among individuals with eczema; however, research investigating its application remains limited. This study aims to evaluate the use of CAM among patients in the Tabuk Region. **Methods:** This cross-sectional study was conducted in the Tabuk region from April to May 2023, involving 385 adult participants selected via a non-probability sampling method. Data were collected using a structured web-based questionnaire, designed based on two previous studies on CAM and reviewed by three consultant dermatologists. Written consent was obtained from all participants prior to their completion of the online questionnaire and data analysis was performed using the Statistical Package for Social Sciences. **Results:** Participants with eczema reported increased comfort in utilizing CAM, significantly influenced by the support of family members, coaches and peers. All respondents indicated either slight or significant improvements in their condition, with the most notable responses observed in the 30-49 age group experiencing neck and nail lesions. CAM demonstrated particular efficacy among patients with atopic dermatitis when compared to other eczema types. **Conclusions:** Patients with eczema in the Tabuk Region exhibited a positive perception of CAM, with most reporting slight to significant improvements, particularly in cases of atopic dermatitis and lesions on the neck and nails. Further research is warranted to investigate the efficacy and safety of various forms of alternative medicine.

Key Words Eczema, Atopic Dermatitis, Complementary Medicine, Alternative Medicine, Herbal Remedies

INTRODUCTION

Eczema or atopic dermatitis, is an inflammatory skin disorder that commonly first appears in young children. It is recognized as the most reported skin disease in Saudi Arabia, highlighting its significant impact on public health [1]. Characterized by various clinical features-including itching, erythema, papules and scales-eczema manifests as a non-contagious inflammation of the epidermis and dermis. The histological features often include spongiosis, acanthosis, parakeratosis and lymphocytic and granulocytic infiltrates, though the exact cause remains unknown [2]. Genetic and environmental factors are believed to play crucial roles in its development, with the disease exhibiting a variable course over time. In addition to skin symptoms, individuals may also experience fever and asthma, underlining the multifaceted nature of the condition [3].

According to lifetime prevalence studies, specific types of eczema can affect up to 29% of individuals in certain populations, making these conditions among the most prevalent clinical issues. However, the characterization of dermatitis and eczema-related disorders often remains inadequate, leading to common misdiagnoses and overlaps among various types. The types of eczema include atopic eczema (AD), allergic and irritant contact dermatitis, protein contact dermatitis, seborrhoeic dermatitis, asteatotic dermatitis, stasis dermatitis, nummular eczema, dyshidrotic eczema (pompholyx), hand dermatitis and occupational dermatitis [2].

As for the connection of eczema to herbal medicine, nearly half of patients with allergies have reported using herbal treatments, with black seed, anise and olibanum being the most commonly employed [4]. There is a growing global interest in Complementary and Alternative Medicine (CAM), which has roots in Arab medicine dating back centuries. Research into the safety and efficacy of CAM is increasing, particularly as it relates to prevalent conditions like eczema and bronchial asthma, which are often treated with herbal remedies compared to other allergic diseases [5].

A systematic review and meta-analysis conducted in Saudi Arabia found that dermatitis and diseases of skin appendages accounted for 24% of the most commonly reported skin conditions [1]. Previous studies from Saudi Arabia and the United Kingdom indicate a high prevalence of CAM use or intent among patients with eczema and dermatological issues [6,7]. Furthermore, studies from various regions in Saudi Arabia report a favorable public attitude toward herbal medicine, with nearly two-thirds preferring it over conventional prescriptions [8,9]. However, data regarding CAM usage in the Tabuk region remain limited. Despite the growing use of CAM among eczema patients globally, there is a lack of research specifically examining the prevalence and attitudes toward CAM in the Tabuk region of Saudi Arabia. This study aims to fill this gap by providing a comprehensive analysis of CAM usage among eczema patients in this region, thereby contributing to a better understanding of local patient behaviors and informing culturally sensitive clinical practices.

METHODS

Study Design, Setting and Dates: This cross-sectional study targeted the adult population with eczema in Tabuk City, Saudi Arabia, conducted from April to May 2023.

Sample Size and Sampling Technique: The target population for this study consisted of eczema patients residing in the Tabuk region. Participants were selected based on availability using a non-probability convenience sampling method. An online sample size calculator (Raosoft, http://www.raosoft.com/samplesize.html) was employed to determine the appropriate sample size. A margin of error of 5% and a confidence interval of 95% were set, assuming a 50% average response rate for most questions and considering the total population of Tabuk (551,124). Consequently, the required sample size for the study was calculated to be 385 participants.

Eligibility Criteria

- **Inclusion Criteria:** Individuals of any age diagnosed with eczema who agreed to participate in the study
- **Exclusion Criteria:** Exclusion Criteria: Individuals not diagnosed with eczema or those who did not agree to participate in the study were excluded

Data Collection Tool

The questionnaire was developed based on two validated questionnaires utilized in international studies [10,11] and was reviewed by three consultant dermatologists to ensure its relevance and clarity. The primary source of data was an online self-administered survey, where participants voluntarily completed a validated questionnaire after obtaining ethical approval from the Institutional Review Board (IRB). The questionnaire consisted of three sections:

- Section A collected socio-demographic information, including gender, age, educational level, income, nationality and region
- Section B inquired about the duration, size and type of eczema, current prescribed treatments and the use of CAM
- Section C focused on attitudes toward CAM and perceptions of its efficacy. The questionnaire was translated into Arabic to ensure comprehension among participants

Procedure

Data were gathered through a self-administered online questionnaire using Google Forms. The survey was disseminated by well-trained data collectors via social media platforms such as Twitter, Instagram and WhatsApp. Participants were informed about the study's objectives and methodology and were asked to provide informed consent prior to starting the questionnaire.

Validity and Scoring: The questionnaire was validated through expert review, ensuring that the items accurately reflected the constructs being measured. Each section utilized a Likert scale for responses, allowing participants to express their attitudes and perceptions toward CAM on a scale from 1 (strongly disagree) to 5 (strongly agree).

Operational Definitions

- **Eczema:** A chronic inflammatory skin condition characterized by redness, itching and lesions
- **Complementary and Alternative Medicine (CAM):** A range of medical therapies that are not considered part of conventional medicine, including herbal remedies, acupuncture and dietary supplements
- **Socio-Demographic Factors:** Characteristics such as age, gender, education level and income that may influence health outcomes

Statistical Analysis

The initial sample consisted of 385 participants. However, 9 responses were excluded from the final analysis due to incomplete or inconsistent answers that did not meet the inclusion criteria during data cleaning, resulting in a final analytical sample of 376 participants. The sociodemographic characteristics of the study participants (Table 1) highlighted that 86% were male and 66% were aged 18-29. A majority (62%) held a bachelor's degree and most participants (73%) were from Tabuk. Regarding treatment outcomes, 61% reported no improvement, suggesting areas for further investigation. These findings offer a broad overview of the sample, which can be analyzed further to explore potential associations with treatment effectiveness and other factors.

Table 1: Sociodemographic Characteristics of Participants (N = 376)

Characteristic	Category	Frequency (n)	Percentage
Gender	Male	323	86%
	Female	53	14%
Age	Less than 18	33	8.8%
	18-29	247	66%
	30-39	40	11%
	40-49	38	10%
	50 and above	17	4.5%
	No response (NS)	1	0.3%
Does It Work	No improvement	228	61%
	Small improvement	103	27%
	Large improvement	45	12%
Level of Education	Illiterate	5	1.3%
	High school	114	30%
	Bachelor's degree	235	62%
	Higher education	22	5.9%
Income (SR)	Less than 5000	214	57%
	Between 5000-10000	92	24%
	More than 10000	70	19%
Region	Tabuk	276	73%
	Tayma	15	4.0%
	Haql	34	9.0%
	Duba	7	1.9%
	Umluj	39	10%
	Al Wajh	5	1.3%

SR: Saudi Riyal

Table 2: Standardized Questionnaire

Question	Code
CAM providers give good information on maintaining a healthy lifestyle	Q1
There are fewer side effects when taking natural remedies	Q2
CAM involves natural plant formulas, which are healthier than taking drugs given by a medical doctor	Q3
I would be more likely to use CAM if there were more CAM clinics	Q4
I feel more empowered when using CAM because CAM providers involve me in decisions about healthcare	Q5
CAM builds up the body's defenses and promotes self-healing	Q6
The more knowledge I have about CAM, the more likely I will use it	Q7
Parent(s) and family can influence CAM use by exposing me to it	Q8
I am more likely to use CAM if my friends are using it	Q9
I am more likely to use CAM if coaches and teachers discuss it with me	Q10
Belief in the physical, mental and spiritual aspects of health makes me more likely to use CAM	Q11
Fear of treatment discomfort from medical doctors makes me more likely to use CAM	Q12
I believe that taking CAM therapies is not harmful	Q13

CAM: Complementary and Alternative Medicine

A panel (N = 376) was designed to cover different demographic characteristics and was used for all the analyses. The main demographic characteristics of the panel are summarized in the attached AT 1. Both univariate and multivariate logistic regression were employed to analyze the relationship between the predictor variables (Table 2) and the response variable (namely, 'Usage of Complementary Medicine, Yes (= 1) and No (= 0).'). Univariate and multivariate logistic regression were performed in R (1) using the RStudio environment [2].

After reviewing the literature, a standardized questionnaire was developed for cross-sectional interviews (Table 2).

Results were plotted and an Assessment of scale quality was performed using the R Statistical Software. To determine the reliability of the constructs, alpha coefficients and Cronbach's alpha might be inaccurate measures of internal consistency and might overestimate the results, even some authors recommended against their use [6]. Therefore, the omega coefficient (ω) with bootstrapped 95 percent confidence intervals (CIs) was reported in the results section.

RESULTS

Univariate and Multivariate Logistic Regressions

Table 3 presents the results of univariate and multivariate logistic regressions. In the univariate analysis, the odds of the response variable significantly increased for individuals over 30 years old, particularly in the 30-49 age range, those from Region 3 and with a longer duration of skin conditions measured in weeks. A positive response was also associated with neck involvement and the use of certain dermatologic treatments.

In the multivariate regression, the odds of the response variable increased for all age-related predictors (except for those under 18). Higher income and longer durations of skin conditions (except in days) were also associated with increased odds, especially when nails and neck were involved, for patients with Atopic Dermatitis

Table 3: Univariate and Multivariate logistic Binomial regression, OR = Odds Ratio, CI = Confidence Interval. Variables in grey are statistically significant (p-value<0.5)

Characteristic	Category	Univariate regression			Multivariate Regression		
		OR	95% CI	p-value	OR	95% CI	p-value
Gender	Male	-	-	-	-	-	-
	Female	1.04	0.56, 2.00	0.900	1.65	0.58, 4.93	0.400
Age (years)	Less than 18	-	-	-	-	-	-
	18-29	1.51	0.63, 4.19	0.400	2.50	0.64, 10.80	0.200
	30-39	4.50	1.60, 14.20	0.006	9.11	1.72, 53.10	0.011
	40-49	5.00	1.76, 16.00	0.004	5.84	1.06, 34.80	0.046
	>50	4.00	1.11, 15.40	0.037	10.20	1.00, 126.00	0.059
Level of Education	Illiterate	-	-	-	-	-	-
	High school	2.42	0.34, 48.20	0.400	3.84	0.12, 252.00	0.500
	Bachelor's degree	1.47	0.21, 29.00	0.700	1.51	0.05, 98.00	0.800
	Higher education	2.77	0.34, 59.10	0.400	15.60	0.38, 1,259.00	0.200
Income (SR)	Less than 5000	-	-	-	-	-	-
	5000 - 10000	1.61	0.96, 2.69	0.068	0.85	0.36, 1.96	0.700
	More than 10000	0.93	0.50, 1.69	0.800	0.32	0.10, 0.90	0.036
Region	Tabuk	-	-	-	-	-	-
	Tayma	1.69	0.55, 4.85	0.300	0.61	0.12, 2.81	0.500
	Haql	2.26	1.09, 4.66	0.027	0.51	0.15, 1.75	0.300
	Duba	3.38	0.73, 17.50	0.120	4.01	0.55, 30.50	0.200
	Umluj	1.00	0.46, 2.05	0.900	0.87	0.27, 2.65	0.800
	Al Wajh	0.63	0.03, 4.37	0.700	0.12	0.00, 2.92	0.300
Duration of Skin Condition	Less than 30 Days	-	-	-	-	-	-
	Less than 4 weeks	2.39	1.00, 5.79	0.051	14.90	3.88, 62.90	<0.001
	Less than 12 months	1.71	0.84, 3.64	0.150	3.67	1.19, 11.90	0.026
	More than 1 year	1.48	0.77, 2.99	0.300	3.51	1.23, 10.50	0.021
Part Involved	Face	-	-	-	-	-	-
	Head	1.50	0.37, 5.17	0.500	4.00	0.48, 27.70	0.200
	More than one	1.59	0.91, 2.90	0.120	1.92	0.81, 4.64	0.140
	Nails	2.81	0.74, 10.40	0.120	9.48	1.42, 65.70	0.020
	Neck	13.50	1.86, 272.00	0.024	67.80	2.30, 3,462.00	0.025
	Palm	1.35	0.43, 3.84	0.600	3.65	0.70, 17.90	0.110
Number of Parts Involved	Single region	-	-	-	-	-	-
	Two regions	1.20	0.64, 2.23	0.600	0.79	0.30, 2.04	0.600
	Three regions	1.94	0.87, 4.30	0.100	1.86	0.58, 6.11	0.300
	Four regions	1.04	0.61, 1.75	0.900	-	-	-
Type of Eczema	Don’t know	-	-	-	-	-	-
	Dyshidrotic eczema (Pompholyx)	1.19	0.25, 4.42	0.800	0.74	0.08, 6.00	0.800
	Atopic dermatitis (AD)	1.81	0.84, 3.80	0.120	5.14	1.51, 17.90	0.009
	Seborrheic dermatitis	1.77	0.63, 4.68	0.300	0.82	0.18, 3.51	0.800
	Allergic contact dermatitis	2.04	0.87, 4.63	0.090	1.31	0.41, 4.19	0.600
	Irritant contact dermatitis	1.39	0.19, 7.29	0.700	0.11	0.01, 1.38	0.087
	Seborrheic dermatitis	0.70	0.04, 4.80	0.700	1.61	0.06, 16.50	0.700
	Stasis dermatitis	16,021,740.00	0.00, NA	>0.900	72,078,179.00	0.00, NA	>0.900
	Nummular dermatitis	1.39	0.06, 14.70	0.800	1.45	0.01, 70.20	0.900
	Seborrheic dermatitis, dyshidrotic eczema	16,021,740.00	0.00, NA	>0.900	9,589,919.00	0.00, NA	>0.900
	Seborrheic dermatitis, sebaceous eczema	1.39	0.06, 14.70	0.800	0.41	0.00, 40.20	0.800
	Irritant contact dermatitis, dyshidrotic eczema	0.00	-	>0.900	0.00	-	>0.900
	Allergic contact dermatitis, irritant contact dermatitis	2.78	0.33, 23.60	0.300	9.59	0.56, 133.00	0.092
	Seborrheic dermatitis, dyshidrotic eczema	16,021,740.00	0.00, NA	>0.900	3,782,021.00	0.00, NA	>0.900
Current Dermatologist Prescribed Treatment	Not used	-	-	-	-	-	-
	Steroid creams, moisturizers	1.68	1.06, 2.66	0.027	1.40	0.67, 2.93	0.400
	Anti-histamines	2.16	0.61, 7.06	0.200	1.19	0.24, 5.72	0.800
	Immunosuppressant tablets, steroid tablets, steroid syrup	6.04	1.53, 29.5	0.013	8.65	1.20, 80.2	0.040
Does It Work	No improvement	-	-	-	-	-	-
	Small improvement	14.00	7.93, 25.7	<0.001	36.70	16.1, 92.4	<0.001
	Large improvement	17.80	8.54, 38.9	<0.001	39.10	14.0, 121	<0.001

Variables in gray are statistically significant (p<0.05), OR: Odds Ratio, CI: Confidence Interval, SR: Saudi Riyal

(AD) and when Dermatologist Treatment 3 was utilized. Most participants reported small or significant improvements.

Participants’ responses to the standardized questionnaire are summarized in Table 4 and Figure 1. Overall, "Strongly Disagree" was the most selected response

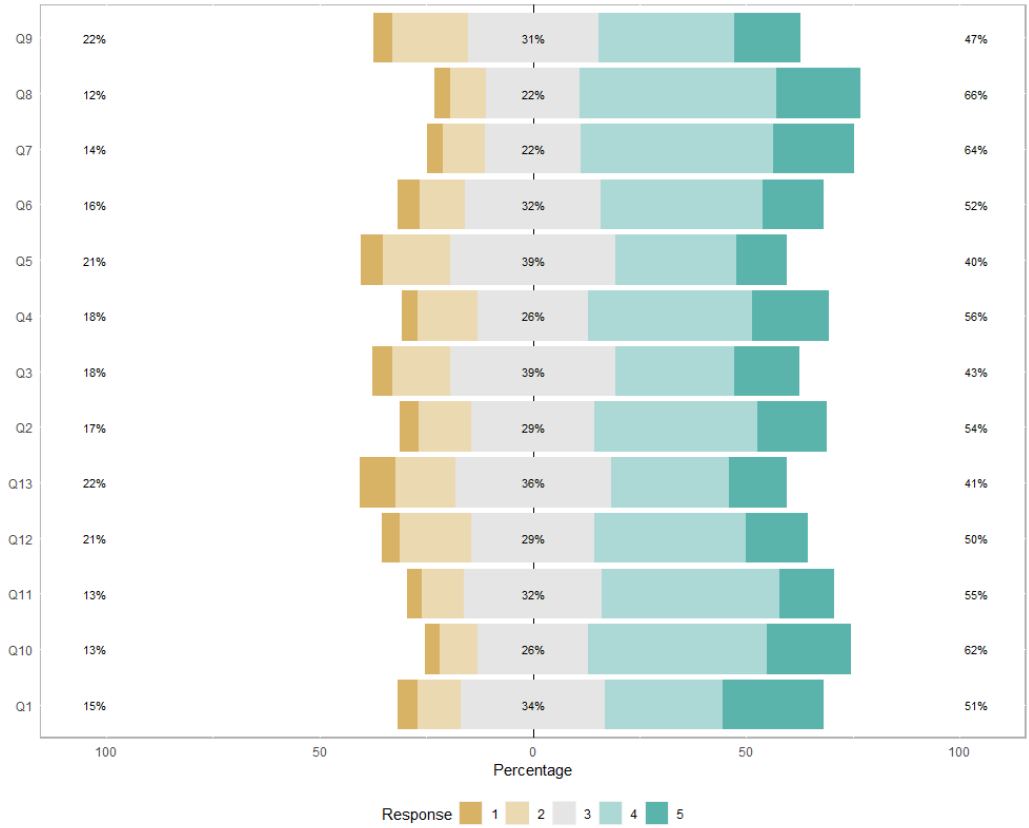

Figure 1: Response to the Standardize Questionnaire

The percentage of "Strongly Disagree" – "Disagree" answers" are given on the left; those of "NS" answers in the center and those of "Agree" – "Strongly Agree" on the Right

Table 4: Response to the Standardize Questionnaire

Questions Code	Strongly Disagree	Disagree	NS	Agree	Strongly Agree
Q1	18	38	127	104	89
Q2	17	46	109	143	61
Q3	17	51	146	104	58
Q4	14	53	97	145	67
Q5	20	59	146	106	45
Q6	20	40	119	143	54
Q7	14	37	84	170	71
Q8	14	32	82	173	75
Q9	17	66	115	120	58
Q10	13	34	97	158	74
Q11	13	37	121	157	48
Q12	16	63	109	133	55
Q13	31	53	137	104	51

NS: No Response, CAM: Complementary and Alternative Medicine

Table 5: Omega reliability measure of internal consistency, n = 376, Positive correlations: 78 out of 78 (100%)

Reliability Measure	Value
Omega (total)	0.93
Omega (hierarchical)	0.71
Revelle's Omega (total)	0.93
Greatest Lower Bound (GLB)	0.94
Coefficient H	0.92
Coefficient Alpha	0.91

across all questions, while "Disagree" was frequently the second choice (with exceptions for Q5, Q9 and Q13). Notably, the "No Response" (NS) option was dominant in questions Q1, Q3, Q5 and Q14. In contrast, for questions Q2, Q4, Q6, Q7, Q8, Q10, Q11, Q12 and Q13, the predominant response was "Agree" (Table 4 and Figure 1).

The total score was calculated to assess internal consistency across all scales, demonstrating strong reliability among the factors. The results are summarized in Table 5.

The bootstrapped replicated ω reliability indicators indicate that all factors exhibit acceptable reliability (values >0.7), confirming that the questionnaire effectively captures the intended concepts. Further categorization of some factors may enhance interpretability of the results.

DISCUSSION

The results of this study indicate a significant association between the usage of Complementary and Alternative Medicine (CAM) and various demographic factors, particularly age. Univariate and multivariate logistic regression analyses demonstrated that the odds of CAM usage increased notably among participants aged 30-49 years, especially in cases of neck eczema persisting for several weeks and those undergoing specific dermatologic treatments. This trend suggests a growing reliance on CAM among middle-aged individuals managing chronic skin conditions.

In analyzing the responses to the standardized questionnaire, we observed that the majority of participants expressed skepticism regarding the potential harms of CAM, as evidenced by a high percentage of "Strongly Disagree" and "Disagree" responses to Question 13, which addressed the perceived harmfulness of CAM. Conversely, participants were more likely to "Agree" or "Strongly Agree" when asked about the influence of family members, knowledge of CAM and the encouragement of coaches and teachers, reflecting the significant role of social networks in shaping health-related beliefs.

The primary aim of this study was to elucidate the relationship between beliefs and attitudes toward CAM. However, it is important to acknowledge the potential impact of respondent honesty on the reliability of data collected via questionnaires. Understanding public beliefs regarding CAM could reveal insights into the motivations for its usage.

The rising interest in CAM can be partly attributed to the limitations of conventional medicine in effectively treating chronic conditions such as cancer, diabetes and hypertension [12]. CAM provides a holistic approach that emphasizes the interconnectedness of mind, body and spirit and this has been linked to favorable attitudes toward its use within the Saudi population [13]. Our findings suggest that CAM is often viewed positively within the community, although it remains possible that such perceptions could be influenced by placebo effects [14].

Historically, the understanding of CAM usage has evolved from a view primarily rooted in faith and spirituality [15] to recognizing a broader set of influences, including social and psychological factors. The role of spiritual beliefs in health outcomes continues to be debated, with evidence suggesting that practices such as prayer can promote relaxation and positively influence overall wellness [16]. Nurses and healthcare providers may play a vital role in advocating for spiritual health, which can enhance patients' experiences, even when physical cures are not achievable [17].

Our study also identified a notable gender disparity in CAM usage, with female participants exhibiting a higher inclination toward CAM than males [18]. This aligns with previous literature indicating that women often perceive CAM as a more holistic approach to health, allowing for greater personal autonomy over their well-being [19]. The prevalence of CAM usage among women may reflect insufficient attention to their health needs within conventional healthcare systems [20].

While CAM presents potential benefits, it is essential to monitor its interactions with traditional medicine carefully. Improperly managed CAM usage can lead to adverse effects, potentially impacting vital organs [21]. Healthcare professionals are ideally positioned to guide patients in making informed decisions about CAM, thereby minimizing harmful side effects and drug interactions. Furthermore, patients should be educated about the limitations of traditional healers, as there is no validated evidence supporting their efficacy in treating eczema or other diseases [22].

In low-income countries, more than 80% of the population relies on CAM products and traditional healing practices [23]. Our survey results indicated that women are more likely than men to utilize CAM; however, this finding contrasts with a study conducted in Enugu Urban, Nigeria, where male usage was more prevalent [24].

The analysis of specific survey questions revealed interesting trends: the majority of participants responded "Agree" to Q2, which posited that natural remedies have fewer side effects. However, neutral responses dominated for questions addressing the health benefits of natural plant formulas (Q3) and the perceived safety of CAM therapies (Q14). These findings suggest that while many participants believe in the relative safety of CAM, awareness of potential adverse effects is still necessary.

Moreover, the survey results highlighted a strong inclination among participants toward using CAM, evidenced by a dominant "Agree" response to multiple questions (Q4, 7, 8, 9, 10, 11, 12 and 13). This outcome reflects the various factors contributing to the widespread acceptance of CAM in society. These findings resonate with other studies that indicate high rates of CAM usage across different populations. For example, a 2014 study in Enugu Urban recorded an 84.7% prevalence of CAM usage among adult participants [24], Similarly a study conducted in Western Saudi Arabia noted a significant prevalence of herbal medication use among allergy patients [25]. In Japan, a large cross-sectional study found that 91.5% of individuals with atopic dermatitis sought alternative treatments, with 39.5% specifically interested in CAM [26].

Table 4, detailing the demographic characteristics and responses of participants, should be presented prior to the logistic regression results. This table will provide a clearer context for the subsequent analyses and enhance the reader's understanding of the data.

In conclusion, this study underscores the multifaceted nature of CAM usage, influenced by demographic factors, social beliefs and individual attitudes. Dermatology professionals should remain informed about the CAM therapies frequently utilized by eczema patients, allowing them to address inquiries effectively and guide patients in their pursuit of appropriate treatments.

The findings highlight the importance of acknowledging and discussing CAM usage in dermatological practice. Dermatologists should proactively engage in open, non-judgmental conversations with eczema patients about their use of CAM, ensuring that patients are aware of both the potential benefits and risks. Integrating safe and evidence-supported CAM practices into conventional treatment plans may enhance patient satisfaction, adherence and outcomes. Furthermore, developing clinician training programs and patient education tools tailored to culturally prevalent CAM practices could support safer, more effective integrative care models.

CONCLUSIONS

This study highlights the significant role of demographic factors, particularly age and gender, in the utilization of complementary and alternative medicine (CAM) among eczema patients in the Tabuk region of Saudi Arabia. The findings suggest that middle-aged individuals, especially those experiencing chronic eczema conditions, are more inclined to seek CAM as a treatment option. The positive attitudes toward CAM, coupled with a belief in its efficacy and safety, emphasize the importance of understanding patient perspectives and preferences.

The results indicate a growing reliance on CAM, which may reflect dissatisfaction with conventional treatment options or a desire for more holistic approaches to health management. Social influences, including family and community perceptions, further shape these attitudes, reinforcing the need for healthcare providers to engage in open dialogues with patients about their treatment choices.

While CAM presents potential benefits, it is essential for dermatology professionals to remain vigilant about the risks associated with its use. Ensuring that patients are educated about both the advantages and limitations of CAM is crucial for promoting safe and effective treatment practices. Overall, this study contributes valuable insights into the patterns of CAM usage among eczema patients, advocating for a more integrated approach that considers both conventional and alternative treatment modalities in dermatological care. Future research should prioritize the investigation of the safety and efficacy of complementary and alternative medicine (CAM) products used by eczema patients.

Limitations

The non-probability convenience sampling method was chosen due to the limited availability of participants within the study timeframe. While this method may introduce selection bias, it allowed for the inclusion of a diverse range of participants, providing valuable insights into CAM usage among eczema patients in the Tabuk region. However, the lack of randomization may limit the generalizability of the findings to the broader eczema patient population in other regions or settings.

Acknowledgement

We thank the participants who were all contributed samples to the study.

Ethical Approval

Approval from the Ethics Committee of University of Tabuk, Saudi Arabia and the IRB Protocol No: UT-270-120-2023.

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